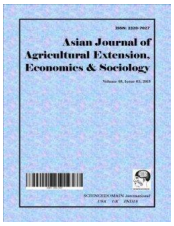

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Attitudinal Disposition of Trained Beekeepers towards Use of Modern Beekeeping Technologies in Oyo State, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author FE designed the study, wrote the protocol and supervised the work. Authors FE and ME carried out data collection and performed the statistical analysis. Author FE managed the analyses of the study. Author ME managed the literature searches and edited the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Beekeeping is a lucrative livelihood activity of the rural dwellers because it offers a great potential for income generation, poverty alleviation, sustainable use of forest resources and diversifying the export base. This paper examined the attitude of trained beekeepers to use of modern beekeeping technologies in Oyo state, Nigeria. Multi-stage sampling was used to select 131 trained beekeepers. The data collected were analysed with the aid of descriptive statistics (frequency, percentage and mean), and inferential statistics tools such as Chi-square, Pearson product moment correlation. The results revealed that there was favourable attitude to use of modern beekeeping technologies. Beekeepers had high (54.2%) participation in training activities and are

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highly knowledgeable (61.8%) on the use of modern beekeeping technologies. Age (r= 0.373, P=0.000); educational status (χ^2 =5.189, df=1, P=0.013); membership of beekeepers association (χ^2 =6.155, df=1, P=0.013) and knowledge of modern beekeeping technologies (r=0.491, P=0.000) of beekeepers determined attitude towards use of modern beekeeping technologies. Similar training in other states will enhance use of modern beekeeping and in turn productivity.

Keywords: Attitude; beekeepers; beekeeping technologies; modern; training.

1. INTRODUCTION

Beekeeping (or Apiculture), is the management of bees in a hive in such a way as to observe its developmental stages and manipulations [1]. Beekeeping is as old as any agricultural practice. It is an alternative source of income to beekeepers especially in rural communities. According to NHB [2], beekeeping is one activity that is gaining interest among the citizens of Oyo State due to the suitability of the state's climate and vegetation, which is predominately a rainforest zone, with derived savannah towards the southern part and characterised by abundance of flowering plants which produce a lot of nectar used by bees to produce honey [3]. However, it has been observed that most beekeepers in the state make use of traditional technologies, which led to poor quality of bee products and low yield, thereby making beekeeping less profitable. Hence, the Ministry of Agriculture harnessed the desire expressed by its citizens to engage in beekeeping by training them on modern beekeeping technologies. The training was organised in April 2011, by the Department of Rural Development under the Oyo State Ministry of Agriculture, Natural Resources and Rural Development. It is therefore hoped that the knowledge acquired from participation in training will help beekeepers to develop favourable attitude towards the use of modern beekeeping technologies; as this is also expected to influence positively their use of modern beekeeping technologies in the study area.

It is in light of this that this paper assessed the attitude of trained beekeeper towards use of modern beekeeping technologies with particular highlight on beekeepers' demographics, participation in training and knowledge on use of modern beekeeping technologies. The hypothesis tested the relationship between beekeepers' knowledge on modern beekeeping technologies and attitude to use of modern.

2. MATERIALS AND METHODS

2.1 Area of Study

Oyo state is located in the South-West geopolitical zone of Nigeria. It was one of the three states carved out of the former Western State of Nigeria in 1976. The State consists of 33 Local Government Areas and has a population of 5,591,589 people [4]. Oyo State covers a total of 27,249 square kilometres of land mass and it is bounded in the south by Ogun State, in the north by Kwara State, in the west it is partly bounded by Ogun State and partly by the Republic of Benin, while in the east by Osun State. The landscape consists of old hard rocks and dome shaped hills, which rise gently from about 500 meters in the southern part and reaching a height of about 1,219 metres above sea level in the northern part. The climate in the State favours the cultivation of crops like Maize, Yam, Cassava, Millet, Rice, Plantain, Cocoa tree, Palm tree and Cashew.

2.2 Population of the Study

The population comprised 394 participants trained by people from the Department of Rural Development in Ministry of Agriculture, Natural Resources and Rural Development of Oyo State.

2.3 Sampling Procedure and Sample Size

Multi-stage sampling procedure was used to select respondents for the study. Out of the 3 senatorial districts in Oyo State, Oyo North and Oyo Central were purposively selected due to the larger number of participants in the training. Oyo North and Oyo Central have 11 and 13 Local Government Areas (LGAs) respectively. Simple random sampling was used to select 45% of the LGAs in the senatorial districts to make 5 and 6 LGAs from Oyo Central and Oyo North respectively. The selected LGAs were Egbeda,

Lagelu, Ibadan-North, Ibadan North-west and Ibadan south-east from Oyo central and Iseyin, Kajola, Saki-west, Irepo, Ogbomosho North and Ogbomosho South from Oyo North senatorial district. Finally, simple random sampling was used to select 65% participants in selected LGAs to make a total of 131 respondents for the study, as shown below on Table 1.

2.4 Measurement of Variables

2.4.1 Dependent variable

2.4.1.1 Attitude to use of modern beekeeping technologies

The information on attitude was obtained using a five-point-Likert scale of strongly agree, agree, undecided, disagree and strongly disagree with scores of 1, 2,3,4,5 assigned respectively for negatively worded attitude statement and the reverse for positively worded statements. Attitude categories were obtained using the mean score to categorise into favourable (≥ mean) and un-favourable (< mean) attitude.

2.4.2 Independent variable

2.4.2.1 Demographic characteristics

Demographic characteristics include, age, gender, religion, marital status, household size and educational status.

2.4.2.2 Participation in training

A list of fifteen (15) activities done during training was presented to respondents from which respondents were to indicate their level of participation based on whether they were: very active = (2), slightly active = (1) and not at all = (0). The mean scores were computed to rank items according to the level of participation by respondents from the greatest to the least in participation. The mean score (17.02) was used to categorise respondents' into high and low participation in training of modern beekeeping technologies.

Fig. 1. Map of Nigeria showing Oyo state with Ibadan
Source: Oyo state Government, 2016 [5]

Table 1. Summary sampling procedures and sample size of respondents

Selected senatorial district	Number of LGA	45 % LGA	Names of selected LGA	Number of trainee	65% proportion of trainee	Cum. Total
			Egbeda	29	19	19
Oyo Central	11	5	Lagelu	18	12	31
			Ibadan North	17	11	42
			Ibadan North-west	21	14	56
			Ibadan South-East	19	12	68
			Iseyin	14	9	77
			Kajola	20	13	90
Oyo North	13	6	Saki-west	18	12	102
			Irepo	12	8	110
			Ogbomosho North	15	10	120
			Ogbomosho South	17	11	131
Total	**24**	**11**		**204**	**131**	**131**

Fig. 2. Map of Oyo State showing its senatorial district and Local Government Areas
Source: Oyo state Government, 2016 [5]

Knowledge of the respondents was measured by obtaining their responses on 20 knowledge statements using dichotomous response of 'Yes' or 'No'. The correct response attracted a score of 1 while incorrect response 0. The highest score was obtained as 19 while the lowest score was 5. The mean score (13.99) was used to categorise respondents into high and low level of knowledge.

2.5 Data Collection and Analyses

Data were collected by interview schedule to avoid misinterpretations and inaccurate responses and were analysed with the aid of descriptive statistical tools such as percentages, mean and frequency distribution, while inferential statistics: Pearson Product Moment Correlation (PPMC) and Chi-Square were used to test hypothesis.

3. RESULTS

Results on Table 2 present the demographic characteristics of respondents. It reveals that the mean age of respondents was 39.8 years, 27.5% were less than 31 years, 31.1% were between 31 and 42 years, 29.8% were between 43 and 54 years, while 10.2% were above 54 years of age. This implies that people of different ages both young and old could take to beekeeping based on their willingness and interest. The result reveals that males were 78.6% while females were 21.4%. Majority (84.7%) of the respondents were married, while 15.3% were single. The household size ranged from 1 to 21 persons, with a mode household size category of 5-8 persons and a mean of 5 persons; 47.3% of the respondents were Christians, while 52.7% were Muslims. The result also revealed that 40.5% had tertiary education, 32.8% had secondary education.

3.1 Participation in Modern Beekeeping Technologies Training

The result on Table 3 shows respondents participation in training on modern beekeeping technologies. It reveals that harvesting of bee products ranked highest in participation. This may be because harvesting of bee product presents direct benefit. Humans prefer to participate in activities that are of direct and economic benefit to them. Furthermore, Table 4 reveals that over half (54.2%) of the beekeepers had high participation in the training, while 45.8% had low participation. The maximum score for participation was 25.0, while the minimum was 9.0. The mean score was 17.02±3.17. This implies that there was fairly high participation in the training activities by the respondents.

Table 2. Distribution of respondents by demographic characteristics (n= 131)

Variables	F	%	Mean
Age (years)			
< 31	36	27.5	
31-42	41	31.3	39.8 years
43-54	39	29.8	
55-66	13	9.9	
Above 66	2	1.5	
Sex			
Male	103	78.6	
Female	28	21.4	
Marital status			
Married	111	84.7	
Single	20	15.3	
Household size			
≤4	46	35.1	
5-8	74	36.5	5 persons
9-12	7	5.3	
>12	4	3.1	
Religion			
Christianity	62	47.3	
Muslim	69	52.7	
Educational status			
No formal education	2	1.5	
Quranic education	9	6.9	
Vocational education	14	10.7	
Primary education	10	7.6	
Secondary education	43	32.8	
Tertiary education	53	40.5	

Source: Field survey, 2014

3.2 Respondent's Knowledge on Modern Beekeeping Technologies

Result on Table 5 presents the summary of respondents' knowledge on use of modern beekeeping technologies. It shows that the grand mean of all the statements was 0.70. Respondents had high knowledge on the following knowledge items: Oyo State is suitable for beekeeping because of its climatic and vegetative conditions are favourable to beekeeping (0.90); bees are social insect that can help in sustainable use of forest resources in Oyo State (0.90). Lizard as a major predator (0.89), bee colony constituents of the queen, the worker and the drone (0.87), absconding is migration of bees from hive in search of a new site due to severe predation and incessant disturbance (0.86). While respondents had low

knowledge on: the optimum temperature in which bees perform (0.22) and honey absorbs water when exposed to the atmosphere (0.39). Generally respondents have high knowledge on more statements on modern beekeeping technologies.

Results on Table 6 revealed that majority 61.8% of the beekeepers were highly knowledgeable on modern beekeeping technologies. The minimum score was 5.0, while the maximum was 19.00. The mean was 13.99±2.81. This implies majority had a good knowledge on modern beekeeping technologies from the training.

3.3 Beekeepers' Attitude towards Use of Modern Beekeeping Technologies

Attitude of beekeepers towards modern beekeeping technologies is a very important phenomenon to take into consideration for sustainable adoption of modern beekeeping technologies. The summary of respondents' attitude towards use of modern beekeeping technologies is shown on Table 7. Using the grand mean 3.76, respondents had favourable attitude towards some of the following statements; the use of bee suit, hat, and veil reduces bee's stings during inspection and harvesting (4.57), the use of modern hive like the Kenya top bar and langstroth hive makes harvesting easier (4.36), bee products from modern beekeeping technologies are more healthier compared to bee products from traditional method (4.24), record keeping as a modern beekeeping technologies ensures the profitable beekeeping enterprise (4.18), use of modern beekeeping technologies produces higher yield of bee products compared to traditional method (4.12). While the respondents were unfavourable towards statements such as; biodiversity conservation is of great relevance in use of modern beekeeping technologies (3.17), predators cannot be controlled using modern beekeeping technologies (3.28), modern beekeeping technologies increases the rate of absconding (3.37), and the use of modern beekeeping technologies is too expensive compared to the profit. (3.21).This implies that generally respondents have favourable attitude towards the use of most area of modern beekeeping technologies.

Table 3. Distribution of respondents by participation in training

S/No	Activities participated during training	Very Active		Slightly active		Not at all	
		(f)	(%)	(f)	(%)	(f)	(%)
1.	Identification of various modern hive	72	(55.0)	31	(23.7)	28	(21.4)
2	Site of an apiary	65	(49.6)	61	(46.6)	5	(3.8)
3.	Harvesting of bee products	93	(71.0)	32	(24.4)	6	(4.6)
4.	Use of extraction machine	87	(66.4)	21	(16.0)	23	(17.6)
5.	Identification of bee products	49	(37.4)	71	(54.2)	11	(8.4)
6.	Constructions of modern hives	45	(34.4)	34	(26.0)	52	(39.7)
7.	Processing of bee products	57	(43.5)	58	(44.3)	16	(12.2)
8.	Management of an apiary	64	(48.9)	58	(44.3)	9	(6.9)
9.	Prevention of absconding	39	(29.8)	62	(47.3)	30	(22.9)
10.	Setting of baits	86	(65.6)	36	(27.5)	9	(6.9)
11.	Pest control	26	(19.8)	55	(42.0)	50	(38.2)
12.	Record keeping	45	(34.4)	39	(29.8)	47	(35.9)
13.	Use of kits	85	(64.9)	24	(18.3)	22	(16.8)
14.	Production of beewax	73	(55.7)	47	(35.7)	11	(8.4)
15.	Maintenance of kits	72	(55.0)	37	(28.2)	22	(16.8)

Source: Field survey, 2014

Table 4. Categorization of respondents by participation in training

Level of participation	F	%	Min	Max	Mean	SD
Low	60	45.8	9.00	25.00	17.02	3.17
High	71	54.2				
Total	131	100				

Source: Field survey, 2014

Table 5. Distribution of respondents by knowledge on modern beekeeping technologies

No.	Items	Correct (f) (%)	Incorrect (f) (%)	Mean	Rank
1.	The manipulation of bee in a colony is referred to as Beekeeping	71 (54.2)	60 (45.8)	0.54	17
2.	Besides honey, beekeeping also results in production of other hive products, which have high economic value both locally and internationally?	108 (82.4)	23 (17.6)	0.82	7
3.	A bee colony consists of the queen, the worker and drone.	114 (87.0)	17 (13.0)	0.87	5
4.	There are many queens in a colony	88 (67.2)	43 (32.8)	0.67	12
5.	Bees always fly back to the place of their own hive, even if the hive has been moved.	105 (80.2)	26 (19.8)	0.80	8
6.	Bees don't react to certain odour or smell.	68 (51.9)	63 (48.1)	0.52	18
7.	The major types of modern hive are the langstroth, Kenya top bar and Tanzania top bar hive?	99 (75.6)	32 (24.4)	0.76	11
8.	One importance of using the cover of the Kenya top bar is to protect the hive against rain	115 (87.8)	16 (12.2)	0.88	4
9.	The apiary site must be in an area of flowering plants within radius of 1km	103 (78.6)	28 (21.4)	0.79	9
10.	A waterlogged area is the best site for apiary.	84 (64.1)	47 (35.9)	0.64	15
11.	It is wise to re- queen after two years	74 (56.5)	57 (43.5)	0.77	10
12.	The brood in a hive refers to eggs, larvae and pupae.	88 (67.2)	43 (32.8)	0.67	12
13.	When honey is exposed to air it releases moisture.	51 (38.9)	80 (61.1)	0.39	19
14.	Lizard is one the major predators of bees	117 (89.3)	14 (10.7)	0.89	3
15.	Oyo state is suitable for beekeeping because of its climatic and vegetative conditions are favourable	118 (90.1)	13 (9.9)	0.90	1
16.	Absconding is migration of bees from hive in search of a new site due to severe predation and incessant disturbance	113 (86.3)	18 (13.7)	0.86	6
17.	Beeswax is the best baiting material to use in colony establishment	83 (63.4)	48 (36.6)	0.63	16
18.	Bees perform optimally temperatures between 20^0c-35^oc.	29 (22.1)	102 (77.9)	0.22	20
19.	Modern beekeeping cannot be practised with other income generating activity	86 (65.6)	45 (34.4)	0.66	14
20.	Bees are social insect that can help in sustainable use of forest resources in Oyo state	118 (90.1)	13 (9.9)	0.90	1

Grand mean: 0.70
Source: Field survey, 2014

Table 6. Categorisation of respondents by level of knowledge on modern beekeeping technologies

Level of knowledge	F	%	Min	Max	Mean	SD
Low	50	38.2	5.00	19.00	13.99	2.81
High	81	61.8				
Total	131	100				

Source: Field survey, 2014

Table 7. Distribution of respondents by attitude towards use of modern beekeeping technologies

	Attitudinal statements	S A	A	U	D	SD	Mean
		F (%)	F (%)	F (%)	F (%)	F (%)	
1.	Use of modern beekeeping technologies produces higher yield of bee products	84 (64.1)	21(16.0)	5 (3.8)	0 (0.0)	21(16.0)	4.12
2.	The use of modern hive like the Kenya top bar and langstroth	59(45)	62(47.3)	8 (6.1)	2 (1.5)	0 (0.0)	4.36
3.	Modern beekeeping technologies increases the rate of absconding.	27(20.6)	18(13.7)	9(6.9)	34(26.0)	43(32.8)	3.37
4.	In Modern beekeeping technologies there are special consideration in selection	39(29.8)	74(56.5)	9(6.9)	4(3.1)	5(3.8)	4.05
5.	Modern beekeeping technologies equipment are too complex for my use	10(7.6)	21(16.0)	16(12.2)	70(53.4)	14(20.7)	3.44
6.	Bee products from modern beekeeping technologies are more healthier	60(45.8)	52(39.7)	12(9.2)	5 (3.8)	2(1.5)	4.24
7.	Equipment used in Modern beekeeping technologies are available	54(41.2)	29(22.1)	17(13.0)	25(19.1)	6(4.6)	3.76
8.	The use of Modern beekeeping technologies is too expensive	17(13.0)	18(13.7)	29(22.1)	55(42.0)	12(9.2)	3.21
9.	Harvesting of comb when it in brooding stage is detrimental to the	45(34.4)	44(33.6)	27(20.6)	10(7.6)	5(3.8)	3.87
10.	Traditional beekeeping is profitable even without record keeping.	10(7.6)	26(19.8)	18(13.7)	39(29.8)	38(29.0)	3.53
11.	Biodiversity conservation is of great relevance	15(11.5)	44(33.6)	42(32.1)	44(33.6)	22(16.8)	3.17
12.	It is a waste of time and resources using bee-suit, hat, veil and hand gloves.	18(13.7)	14(10.7)	3(2.3)	35(26.7)	61(46.6)	3.82
13.	Swarming tendency can be detected and reduced	28(21.4)	56(42.7)	30(22.9)	12 (9.2)	5(3.8)	3.69
14.	Predators cannot be controlled	17(13.0)	29(22.1)	14(10.7)	43(32.8)	28(21.4)	3.28
15.	Traditional beekeeping is still more profitable	7(5.3)	13(9.9)	20(15.3)	41(31.3)	30(38.2)	3.87
16.	There is loss of biodiversity in the of traditional beekeeping technologies.	17(13.0)	46(35.1)	28(21.4)	29(22.1)	11(8.4)	3.22
17.	Higher yield bee products are produced by use of traditional method.	10(7.6)	23(17.6)	24(18.3)	43(32.8)	31(23.7)	3.47
18.	Harvesting of brood makes the honey ferment within a short time.	41(31.3)	68(51.9)	8(6.1)	9 (6.9)	5(3.8)	4.00
19.	The use of bee suit, hat, and veil reduces bee's stings	76(58.0)	53(40.5)	2(1.5)	0 (0.0)	0 (0.0)	4.57
20.	Record keeping as a modern beekeeping technologies ensures its profitability	48(36.6)	58(44.3)	25(19.1)	0 (0.0)	0 (0.0)	4.18

Grand mean: 3.76

SA: Strongly agree A: Agree U: Undecided D: Disagree SD: Strongly disagree

Source: Field survey, 2014

Table 8. Categorisation of respondents by attitude towards the use modern beekeeping technologies

Attitude to use	Frequency	%	Min.	Max.	Mean	SD
Unfavourable	62	47.3	54.0	98.0	75.20	8.28
Favourable	69	52.7				
Total	**131**	**100**				

Source: Field survey, 2014

Table 9. Correlation and chi-square analysis between selected demographics and attitude towards use of modern beekeeping technologies

Variables	r	χ^2	df	Cc	P	Decision
Correlation result					0.000	S
Age	0.373					
Household size	0.128				0.148	NS
Chi-Square results						
Sex	…	1.927	1	0.120	0.165	NS
Beekeeping ass.	…	6.155	1	0.212	0.013	S
Marital status	…	6.155	1	0.212	0.393	NS
Educational status	…	5.189	5	0.195	0.013	S

S = Significant @P≤0.05 and NS = Not Significant @p>0.05

Results on Table 8 above revealed that 52.7% of respondents had favourable attitude towards the use of modern beekeeping technologies, while 47.3% of respondents had unfavourable attitude. The minimum score was 54.0, while the maximum score was 98.0. The mean attitude was 75.20±8.28 which suggest that respondents' attitude must have being influenced by the knowledge acquired from training.

The results of analysis on Table 9 above reveals that significant to attitude towards use of modern beekeeping technologies was age (r=0.373, p=0.00, n=131), membership of beekeepers association (χ^2 =6.155, df=1, P=0.013) and educational status (χ^2 =5.189, df=5, P=0.013). The significance of age implies that the older the farmer the more favourable attitude they would towards use of modern beekeeping technologies.

However the study found no significant relationship between household size (r= 0.128, P=0.148, n=133), sex (χ^2 =1.927, df=1, P=0.165) and marital status (χ^2=6.155, df=5, P=0.393) with attitude towards use of modern beekeeping technologies. This implies that beekeepers' household size, sex, marital status did not influence respondents' attitude towards use of modern beekeeping technologies.

The result on Table 10 revealed that knowledge was significantly (r= 0.491, p =0.000) and positively related to attitude towards use of modern beekeeping technologies. This implies that knowledge of modern beekeeping technologies positively influenced the attitude of respondents towards use of modern beekeeping technologies.

Table 10. Correlation analysis between knowledge and attitude towards use of modern beekeeping technologies

Variables	R	P	Decision
Knowledge	0.491	0.000	S

S = Significant @P≤0.05

4. DISCUSSION

The mean age of respondents and be fair distribution of respondents across. The age bracket implies that people of different ages both young and old could take to beekeeping based on their willingness and interest. This finding corroborates with [6] who found that age was not a restriction of involvement in beekeeping activity. Also the high participation of males confirms the finding of Babatunde, Olorunsanya, Omotesho, Alao [7], indicating that majority of beekeepers are males, this likely due to the notion that beekeeping is perceived as an hazardous occupation, since beekeepers are exposed to the risk of being stung by bees. Majority of the respondents were married agrees in line with the findings of Afees, Olufunmi and Saidat [8] who found that a large proportion of the beekeepers were married. The mean household size of 5 persons implies that

respondents have a fairly small household size. Beekeeping, unlike other agricultural enterprise has little labour requirements; hence do not need family as source of labour. The almost equal number of Christians and Muslims suggests that the training had no religious discrimination. The high level of education of respondents may have influenced their attitude to use of modern beekeeping technologies and their participation in training. This corroborates Nnema and Adaeze [9] who posited that education influences the readiness to involve and flexibility towards change.

Harvesting of bee products ranked highest in participation in the training, this may be because harvesting of bee product presents direct benefit. Humans prefer to participate in activities that are of direct and economic benefit to them. This supports the findings of Gamze et al. [10], who reported that honey production plays a very important role as a source of increasing rural income in sustainable development. The high participation in the training is expected to lead to increased knowledge of modern beekeeping technology. Furthermore, the high knowledge of modern beekeeping technologies will help them to develop favourable disposition towards the use of modern beekeeping technologies. This corroborates with Tolera [11], who found that there was positive attitude towards beekeeping and honey production due to training.

The age of respondents significantly correlated with their attitude; hence the older the farmer the more favourable disposed they were towards the use of modern beekeeping technologies. This contradicts the findings of Ogunyemi, [12] who indicated an indirect relationship between age and attitude to adoption of agricultural technology. The significant relationship with membership of beekeeping association is expected since the association helped in dissemination of information about the training. The relationship of educational status implied that education influences attitude towards use of modern beekeeping technologies. Also the correlation between knowledge of modern beekeeping technologies and attitude is in tandem with Sangotegbe [13] position that knowledge is an important determinant of attitude towards use of agricultural technologies.

4.1 Beekeeping and Modern Beekeeping Technologies

Beekeeping has been an ancient practice kept for various products, though the technique adopted in their rearing varies from time to time as well as from place to place. According to Smith [14], the history of beekeeping can be divided into three categories, these are:

a. Bees Hunting: This was earliest method of beekeeping it is still practiced in many communities of Africa such as the Wakamba or Kalenjin tribe in Kenya and the Ngamo or Tiv tribes in Nigeria [15].
b. Traditional Hives: Africa had the longest history of traditional beekeeping, the honey hunting and the beekeeping making use of traditional beehives were maintained with little or innovation Traditional hives comes in various types. These include the grass hive, which was most practiced in the Sahel regions where wooden boards or timber are scarce, the gourd hive and log hive, which is most common in the West African coast such as Ghana and Guinea-Bissau and in Eastern Africa such as Kenya and Tanzania, and the clay-pot hive which is the cheapest and most durable of all the traditional hives, is very popular especially in the northern savannah of West Africa. Traditional beekeeping utilizes cheap and plentiful local materials for hive construction, some of which would otherwise be wasted. However, the use of traditional had several disadvantages, in that its beehives cannot be easily manipulated, combs cannot be inspected at all, and detached combs could not be replaced easily. It also involves the use of crude implements in harvesting as well as crude method of honey extraction. Thus bee byproducts had short shelf life and were unfit for international market. Hence, it created a need for modern beekeeping technologies.
c. Modern beekeeping: this was introduced to Africa from North America where the European honey bee was being reared by immigrants from Europe. Modern beekeeping fundamental involves the reutilization of bee colonies for which it was called for to develop a method of honey harvesting with a lesser load on them [16]. Ramoni, [17] posited that the three types of modern hives are most commonly used, are: fixed comb hives, removable comb hives with top bars such as the Kenya top bar and Tanzanian top bar hive and removable comb hives with frames which is langstronth.

The structure of these beehives allowing the inspection and management of multiple frames of honeycomb individually has enabled beekeepers to carry out various management tasks including division of a colony, addition of empty frames for harvesting honey or inversely thinning out surplus frames to build a more compact colony.

Similarly the quality and quantity of other products such as which royal jelly, propolis and beeswax, harvested along with the extraction of honey is improved through the use of modern beekeeping technologies. Thus modern beekeeping can be deemed as a technology in that, while its primary pursuit concerns the production of honey, has evolved also around the efforts to obtain other articles, the secondary and the tertiary products with higher added value. Gikungu [18] opined that modern beekeeping could be identified as a style of beekeeping that can meet the diverse requirements arising from the diversification of objectives of honey bee utilization. To achieve this several beekeeping resources that are still needed in many African countries include the following:

- Equipments, smokers, extractors, stainless storage containers
- Trained extension officers in beekeeping
- Books and training manuals for beginners and trainers of trainer (TOT)
- Field guide of bee plants including honey-dew producing plants
- Floral calendars of different eco-regions
- Migratory beekeeping policies and apiary regulations
- Rules and regulations on pesticides
- Apiary inspection services
- Authorized queen breeders. So far the well known commercial queen breeders are found in Kenya, South Africa, Morocco, Libya and Egypt.
- Infrastructure and honey collecting centers or market places with proper storage facilities
- Websites
- Increased regional beekeeping colleges

5. CONCLUSIONS AND RECOMMENDATIONS

From the foregoing, it can be concluded that there is favourable attitude to use of modern beekeeping technologies among trained beekeepers in Oyo State. Beekeepers had high participation in training activities and are high knowledgeable on the use of modern beekeeping technologies. In line with this the study recommends that similar training in other states should be done to enhance use of modern beekeeping and in turn productivity of beekeeping products.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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